with the definition of which little serious fault is, in most cases, to be found, though there may often be room for difference of opinion.

Perhaps the most valuable feature is the section which describes the distribution of igneous rocks in the British Isles, and the maps, mostly taken, by permission, from well-known papers, with which it is illustrated.

The work may be safely recommended as a text-book for students, but they should be warned against the employment of the numerous little-known and unnecessary rock-names to be found in its pages. In almost every case the same idea can be more happily expressed by prefixing a word or phrase to a well-established name. Their presence, however, undoubtedly increases the value of the book as a work of reference. J. W. E.

Catalogue of the Lepidoptera Phalaenae in the British Museum. Vol. vii. Catalogue of the Noctuidæ in the Collection of the British Museum. By Sir George F. Hampson, Bart. Pp. xv+709; plates cviii–cxxii; 184 text-figures. (London: Printed by Order of the Trustees, 1908.)

In no group of animals and plants is the enormous increase in our knowledge more conspicuous than in insects. Thus, at the time of the publication of the twelfth edition of Linné's "Systema Naturæ" (1767), we find only 112 species described under Noctuæ. Sir George Hampson now divides the family Noctuidæ into fifteen families, of which the first three are Agrotinæ, Hadeninæ, and Cucullianæ, the species belonging to each being described in vols. iv.–vi. of the general "Catalogue of Moths" respectively, and vol. vii., now before us, forms the first of three volumes intended to be devoted to the fourth subfamily of Noctuidæ, the Acronyctinæ, and includes descriptions of species numbered from 2748 to 3590, a considerable number of which (and also many genera) are described as new by the author.

It is possible that all the remaining families of Noctuidæ may not require a whole volume apiece, and it would be difficult to estimate the total number of Noctuidæ which the present work is likely to contain when completed, but it can scarcely be less than 20,000 species, and may well be 30,000, or even more, as against the 112 species which were all that were known to Linné, the most learned entomologist of his time, in 1767.

We notice no alteration in the general arrangement of the work, and the usual high standard of letter-press and illustrations is fully maintained in the present volume.

Physikalische Musiklehre. Eine Einführung in das Wesen und die Bildung der Töne in der Instrumentalmusik und im Gesang. By Dr. Hermann Starke. Pp. viii+232. (Leipzig: Quelle and Meyer, 1908.) Price 3.80 marks.

This little work on the physical theory of the nature and production of musical sounds is almost entirely free from mathematics, and may be regarded for the most part as an abstract of the simpler portions of Helmholtz's great classic, "The Sensations of Tone." The text is, however, freely illustrated by cuts, many of which, the author acknowledges, are borrowed from other books; thus at every few pages may be found an old and familiar figure.[1]

The treatment is divided into five parts or chapters. Of these the first and second are occupied with the origin and propagation of waves and sound, while the third describes musical tones, intervals, and scales. The fourth chapter consists of four parts, dealing respectively with (i.) stringed instruments, (ii.) wind instruments, (iii.) vibrating bodies with inharmonic overtones, and (iv.) human speech and song. The last chapter is devoted to consonance and dissonance, and after giving Helmholtz's theory concludes with a *résumé* of more recent work on the subject. This part includes notices of intermittence and variation tones, and of the work and theories of C. Stumpf.

To those who wish for a bright, readable treatment of this borderland between music and physics, free from mathematics, but with the opportunity of improving their conversance with German, this book is heartily recommended. E. H. B.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of Nature. *No notice is taken of anonymous communications.]*

Electrons and the Absorption of Light.

On the theories of dispersion given by Drude and Lorentz, an absorption band in the spectrum corresponds to the free period of an electron, and, if we assume that only one electron in each molecule is concerned with an absorption band, it is theoretically possible to calculate e/m for this electron from the values of the coefficient of extinction throughout the band. I have made this calculation, apparently for the first time, using the formula

$$\frac{e}{m} = 1\cdot297\ \nu\bar{\kappa}\frac{\lambda_1 - \lambda_0}{\lambda_0{}^3},$$

which may be derived on both the above theories. $\bar{\kappa}$ is the maximum value of the coefficient of extinction, λ_0 the position of the maximum, λ_1 the wave-length, for which the coefficient of extinction has a value equal to half its maximum, and ν the index of refraction. The following table gives some results:—

Substance	λ_0	e/m	Source of data
	μμ		
Fuchsin in alcohol...	550	1·8 10^7	Stanislaw Kalandek *Phys. Zeit.*, 9 Jahr., s. 128–35
Phloxin in water	515	1·4 10^7	
Crystal violet in alcohol ...	575	4·9 10^7	
Corallin in alcohol	465	1·6 10^6	
Methylene blue in water ...	665	5·4 10^6	
Water blue in water	575	8·1 10^6	
Eosin in water	515	6·9 10^6	
Eosin in water	516	9·2 10^6	Georg. J. Katz Inaug. diss., Erlangen, 1898
Cyanine in alcohol	587	5·8 10^6	
Cobalt chloride in water ...	504	2·5 10^3	Houstoun and Russell Proc. Roy. Soc. Edin., vol. xxix., part ii., p. 68
Uranyl nitrate in water ...	486	34	
	473	75?	
Three glasses coloured with CoO	644	5·0 10^4	R. Zsigmondy, *Ann. d. Phys.* (4), 4, 1901, s. 60 Figures taken from curves
	631	3·0 10^4	
	640	3·0 10^4	
Two glasses coloured with Cr_2O_3	620	3·2 10^4	
	655	1·2 10^4	
Three glasses coloured with NiO	640	1·3 10^4	
	640	1·0 10^4	
	610	1·1 10^4	

For the anilin colouring matters e/m is of the order 10^7, whereas for the glasses and inorganic salts it is of the order 10^4 and under, showing that in the one case we are dealing with electrons and in the other with ions. A calculation made by Drude from the dispersion of solid cyanine in the neighbourhood of its band gave $e/m = 8\cdot5 \times 10^6$. If there are two electrons for each of the original molecules of the colouring matter the values of e/m should be halved, or if there is only one electron for two molecules the value of e/m should be doubled. According to Kalandek, corallin probably undergoes some change in solution. This may account for the low value of e/m.

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[1] Perhaps it is this practice which has led to the representation of a metal *strip* vibrating like a *string* (p. 22), for the same error occurs in Tyndall's "Sound" (p. 128), 1895.

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These results cannot be obtained on Planck's theory.

I hope shortly to publish a full account of the assumptions involved in this calculation, together with additional results. R. A. Houstoun.

Physical Laboratory, University, Glasgow, May 14.

Dimensional Changes produced in Iron and Steel Bars by Magnetism.

While engaged on research work of an engineering nature, I came upon some facts with regard to the behaviour of magnetism on iron and steel bars in the semi-plastic state beyond the yield point that I am unaware have been noted before. I propose, therefore, to give a brief account of the experiments carried out and the results obtained, on the chance that they may prove of interest to others who have time to pursue the matter further.

A specimen of mild-steel about 18 inches long, ¾-inch diameter, and 8 inches between gauge points, having been fixed in the jaws of the testing machine, was surrounded by a solenoid, and a current supplied sufficient to cause magnetic saturation. The specimen had then a tensile load applied to it in the usual way until it ruptured, the magnetism being kept at the saturation point all the time. Other bars were then tested, with and without magnetism, and in the result it was found that the magnetised bars were distinctly less in length between gauge points than the unmagnetised—in other words, that the elongation was less in the first case than in the second.

In order to make the comparison as fair as possible, and to eliminate the effects of difference of composition and of manufacture, the specimens for each experiment (consisting of the rupturing of one unmagnetised and one magnetised specimen) were each cut from the same bar. A few of the results are given in the table below. These were taken at random from a large number of examples, and will serve to give some idea of the nature of the changes. The material in each case (with the exception of experiment No. 10, in which it was wrought iron) was ordinary mild-steel taken from bars about 12 feet long, just as they were delivered to the laboratory.

No. of experiment	Diameter of specimen (inches)	Extension on 8″ length bar Unmagnetised	Extension on 8″ length bar Magnetised	Decrease in extension	Percentage decrease in extension	Breaking load (*a*) Unmagnetised (*b*) Magnetised	Maximum load (*a*) Unmagnetised (*b*) Magnetised
1	¾	2·6	2·19	0·41	15·8	(*a*) 18,680 (*b*) 18,845	(*a*) 26,185 (*b*) 25,910
2	¾	2·5	2·25	0·25	10·0	(*a*) 18,080 (*b*) 18,800	(*a*) 26,115 (*b*) 26,040
3	¾	2·5	2·25	0·25	10·0	(*a*) 18,960 (*b*) 18,970	(*a*) 26,170 (*b*) 25,930
4	¾	2·5	2·25	0·25	10·0		(*a*) 26,240 (*b*) 26,100
5	¾	2·65	2·35	0·30	11·9	(*a*) 20,030 (*b*) 20,130	(*a*) 26,580 (*b*) 25,400
6	¾	2·45	2·25	0·20	8·2	(*a*) 18,630 (*b*) 18,120	(*a*) 26,770 (*b*) 26,290
7	⅞	2·55	2·43	0·12	4·7	(*a*) 23,030 (*b*) 23,000	(*a*) 33,300 (*b*) 33,000
8	⅝	2·5	2·35	0·15	6·0	(*a*) 12,950 (*b*) 13,010	(*a*) 18,500 (*b*) 18,400
9	1	2·5	2·25	0·25	10·0	(*a*) 38,680 (*b*) 36,210	(*a*) 51,360 (*b*) 50,515
10	⅞	2·2	2·15	0·05	2·3		(*a*) 30,900 (*b*) 30,900
11	1	2·5	2·31	0·19	7·6		
12	¾	2·4	2·25	0·15	6·2		
13	¾	2·38	2·28	0·10	4·2		
14	1	2·63	2·35	0·28	10·6		

Units = inches and pounds.

The results may be summarised as follows:—

(*a*) The amount of the decrease of elongation caused by the magnetism varies from about 3 per cent. to 16 per cent.

(*b*) The composition of the steel, its hardness, &c., affect the amount of the decrease of elongation.

(*c*) The average maximum load without magnetism seems higher than the average maximum load with magnetism.

(*d*) The average breaking load without magnetism seems lower than the average breaking load with magnetism.

(With regard to (*c*) and (*d*), nothing definite can be put forward, as it is an extremely difficult matter to gauge the maximum and breaking points to a hundred pounds or so on a 70-ton testing machine.)

(*e*) Careful measurement shows that, after rupture, the magnetised specimen is thicker all over its length than the unmagnetised, but that the greatest difference is at the place of local extension. This points to the likelihood that the magnetism hinders the flow of the metal, and that this hindering action begins just after the yield point is reached, and attains its maximum value at local extension. This is also brought out in the case of the experiment with wrought iron (No. 10), which shows on fracture numerous planes of cleavage that no doubt hindered the formation of "waist," and caused the relatively small decrease of elongation.

The following are readings, taken inch by inch, between 8-inch gauge points on ¾-inch mild-steel specimens cut from the same bar:—

After Rupture.

	1st inch	2nd inch	3rd inch	4th inch	5th inch	6th inch	7th inch	8th inch
Unmagnetised ...	1·24″	1·26″	1·30″	1·38″	1·70″	1·36″	1·24″	1·20″
Magnetised	1·20″	1·23″	1·28″	1·50″	1·50″	1·26″	1·24″	1·20″

The unmagnetised specimen broke almost exactly between the fourth and fifth inches, and the magnetised at the end of the fourth inch.

It was thought possible that if the diminution in elongation were due to the magnetism hindering the flow of the metal, tests on a Brinell hardness testing machine might give some results, but though many were carried out, nothing decisive was obtained. A few compression tests were also made, but insufficient to give trustworthy data. W. J. Crawford.

Municipal Technical Institute, Belfast.

"Blowing" Wells.

In a village about three miles from Norwich, and situated about 140 feet above sea-level, there are three of these "blowing" wells. They are, roughly, about 100 yards apart, and each is 3 feet in diameter and from 70 feet to 80 feet in depth. When last opened, some years back, they were found to be empty of water. One of them was then domed over with an iron dome, which after a time blew off owing to the pressure of air (or other gases) within the well. The other two wells have since been domed over in a similar manner, but it was necessary to insert a 3-inch ventilation pipe into the dome in each case because of the great pressure of air that sometimes accumulates within.

Observation shows that this pressure is sometimes positive for several consecutive days, and that the air then comes out of the ventilation pipe with considerable force, so much so that, in the case of one well which has a grating over the end of the pipe, the well "roars" so loudly that it can be heard for a distance of several yards. At other times the pressure in the well is negative, and then leaves and other débris get sucked into the grating. There is a strong belief, locally, that an accurate forecast of the weather can be gauged by the intensity of the "blowing." I have never heard or read of similar "blowing" wells, and it is difficult to assign an adequate explanation for this alternating positive and negative pressure in the well. Can there be any connection between the blowing and changes in atmospheric pressure, as is locally supposed, or do the rise and fall of the level of the water in the river Yare (which is about two miles distant, and is at this point only about 4 feet above sea-level) have any possible effect on this curious phenomenon?

Norwich, May 3. Sydney H. Long.

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